PREPAREDNESS FOR CHEMICAL AND BIOLOGICAL THREATS TO HOMELAND SECURITY: A GLASS HALF EMPTY; A GLASS HALF FULL

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Policy makers, let alone the general public, did not think much about it until a task so common, so mundane as opening the post came to be seen as a potentially deadly risk. The anthrax mailings in the autumn of 2001 drove into the national consciousness the realization that terrorism and other threats to the security of the U.S. homeland could involve unconventional weapons, including the deliberate spread of disease. The use of the nerve gas sarin by the Aum Shinrikyo in the Tokyo subway in March 1995 had awakened some policy makers to the potential interest of non-state actors in obtaining and using such capabilities. But it was only after the tragic events of September 11 and the subsequent anthrax experience that fighting violence at home could exploit chemical and biological weapons and became a national priority.

This paper examines recent efforts to address the challenges to homeland security posed by unconventional weapons. Its fundamental conclusion is that the glass is half full and half empty. Although significant progress has been made in developing an effective response to the challenges posed by such weapons, progress is not the same as success. Much work remains to be done.

Three observations about the challenges posed by chemical and biological weapons in the homeland security context are important to make at the outset. First, the threat is complex and multidimensional. It is the product of at least four categories of elements – actor, agent, target, and operational considerations – each of which has many possibilities. Different actors, for example, have different motivations, intentions, technical capabilities, financial resources, organizational structures, and so on. As a result, the actors of concern can range from a lone

wolf (a chemical or biological Unabomber) to the global network of al Qaeda. Obviously, different biological and chemical agents have different properties relating to morbidity, infectivity, persistence, and so on. The many elements in these four categories can be mixed and matched to produce a variety of potential outcomes. Some combinations will produce significant outcomes; some will produce no outcome at all. Those outcomes that are possible include a policy maker's worst nightmare: a contingency such as an effective smallpox attack that is low probability but with very high consequences, with no good metrics to guide decisions regarding resources that should be put against it or the level of planning that should be done for it.

The complexity and multidimensionality of the challenge demands a response that is equally complex and multidimensional if it is to be effective. This means that a framework for successfully responding to the chemical and biological threats to homeland security must span a wide range of essential functions: prevention, preparedness, consequence management and mitigation. Preventative activities are probably similar to those that must be conducted to deal with other homeland security challenges. Like them, they depend for success on good intelligence and law enforcement. Aspects of the response that are unique in considering chemical and biological threats are found in the latter categories of preparedness and consequence management/mitigation. It is for this reason that this paper focuses on efforts in those areas.

The paper also attempts to accommodate space limitations – while confronting both a threat and response of great scope – by focusing more heavily on the biological than the chemical issue. This is the case for two reasons. One, the biological threat is deemed the more severe and the more important to combat successfully. This is not to belittle the tragic consequences that a chemical weapons attack could produce; one need only look at Tokyo's

experience. But of the two, the biological challenge is considered more daunting. Two, the Bush administration has made dealing with bioterrorism one of its homeland security priorities.

A second important general observation is to note the need for recognizing that the levels of uncertainty that attach to biological challenges are uncomfortably high. In part, this uncertainty stems from the large number of factors that could be combined to constitute a threat and produce a particular scenario. The possibilities of drafting credible scenarios about certain actors using certain agents against certain targets in certain ways seem to be limited only by the imagination. A second source of uncertainty is lack of knowledge. The anthrax mailings were a chastening experience that sent many people away to review what they thought they knew (e.g., about the levels of lethal dosages). A third source of uncertainty is the lack of commonly accepted conceptual and analytical tools to address the risks in this area. The combination of probabilities and outcomes, for example, that determine those contingencies that constitute a credible threat envelope against which planning and resource allocations can be done, remains undefined.

A third observation relates to the question of uncertainty and complicates still further the ability to do effective planning or allocate a "reasonable" level of money, time, and attention. The 21st century is being called the "century of biology." The science and technology associated with the life sciences is at the beginning of a revolution that will yield remarkable enhancements to the human condition. But like all science and technology, it could also be used for malign purposes. Standing at the threshold of this revolution, it is impossible to determine which aspects of the life sciences and their associated technology will emerge as the most important and what they will make possible for ill or good (because they will create new opportunities to deal with the problem as well). This particular uncertainty produces difficult questions for a

policy maker or planner about balances that must be drawn between short-term and long-term investments, and between addressing limited numbers of specific known contingencies and dealing with a larger number of unknown possibilities that could serve to surprise and find the nation unprepared.

The wide scope of threat and response, the uncomfortably high degree of uncertainty, and rapidly changing science and technology combine to make it difficult to identify precise measures by which to judge the efficacy of efforts to diminish chemical and biological threats to homeland security. The sections that follow, therefore, will first identify current key efforts underway and then discuss gaps or shortcomings that remain. If the measure of success is a comparison of where the nation is today to where it was even a few years ago, then a positive judgment must be rendered. If the measure is a comparison of where we are today with where most experts think the nation should be, there is no reason for complacency. The agenda remains significant.

The Bush Administration's View

In remarks to the National Institutes of Health (NIH) in early February 2003, President Bush commented that on September 11, "we saw the face of an enemy that … would not hesitate to use biological or chemical or nuclear weapons." The administration has made confronting those threats one of its key homeland security objectives. Indeed, in the *National Strategy on Homeland Security* published in July 2002, the administration listed a series of critical mission areas – one of which was defending against catastrophic threats. It argued that the Chemical/Biological/Radiological/Nuclear (CBRN) terrorism threat "demands new approaches, a focused strategy, and a new organization." To that end, the strategy identifies a number of major initiatives, several of which relate directly to the chemical or biological weapons threat.

These include detecting chemical and biological materials and attacks, with the administration arguing that the ability to quickly recognize and report is critical to diminishing casualties because "the rapid diagnosis of diseases of concern and communication form the backbone of a robust response." Also among the list of major initiatives were developing broad-spectrum vaccines, antimicrobials, and antidotes, harnessing the scientific knowledge and tools to the counterterrorism mission, and implementing the select-agent program.

The *National Strategy for Homeland Security* concludes with the identification of future priorities, including four key areas "for extra attention and carefully targeted increases in federal expenditures." The second priority on the list is defending against bioterrorism. The strategy document lists a number of areas of emphasis to address this priority: improving disease surveillance and response systems; increasing the capacity of public health systems to handle outbreaks of contagious diseases; expanding research on vaccines, medicines and diagnostic tests; and building up the National Pharmaceutical Stockpile. In an accompanying fact sheet, the need to strengthen the public health system is particularly stressed because, in the view of the administration, that system: lacks the surge capacity necessary to deal with a rapid increase in victims that would accompany a serious incident; its information systems are antiquated and inadequate; insufficient efforts have been made to promote mutual aid compacts at the regional level; and training has been insufficient for health-care providers in handling bioterrorism victims.

To deal with the biological weapons challenge, the administration's priorities emerge, and these are the need to invest in capacity building in health and medical capabilities, information infrastructure, and training. Also of critical importance are medical treatments, both currently in terms of acquisition and longer-term in terms of research and development. Beyond

just putting the necessary capabilities and tools into place, the administration stresses coordination both at the federal level of government and between the federal and state and local levels. To achieve these objectives, the administration sought $5.9 billion in FY 2003 specifically to address its bioterrorism agenda, including $1.6 billion to improve public health systems and $2.4 billion to jump- start medical-oriented research and development.

Bush Administration Programs

The administration has programs underway across the critical functions necessary to ensure an effective response to a biological attack: surveillance and reporting, epidemiology, laboratory analysis, preparedness planning, training and education, communication and information, medical research and development, and consequence management and mitigation. The Bush administration launched some of these programs, while others were inherited from the Clinton administration. Whatever their origin, they are many. Space prohibits the identification of most of them, even the important programs. Together, however, they constitute an impressive array of activity. This section will briefly provide some key examples of the administration's approach.

Surveillance and Reporting

As mentioned, the administration identifies surveillance and reporting as a critical function in an overall response architecture. It recognizes, however, that any system based only on responding to bioterrorism is not sustainable, either financially or functionally. For that reason its efforts to improve surveillance capacities are grounded in public health surveillance and reporting systems that seek to exploit a variety of different information sources. The Real-Time Outbreak Detection System (RODS), for example, is a prototype system deployed in Pennsylvania that automatically collects and analyzes data in real time. Information about

symptoms, age, gender, and diagnostic results are pooled at a central location where automated analytical tools assess the data for unusual trends. Another system is the Harvard Consortium, a pilot effort to link ambulatory care patient records in all fifty states and some overseas territories. The Electronic Surveillance System for Early Notification of Community-Based Epidemics, or ESSENCE, seeks to construct a system that monitors patient loads and electronic medical records of military health care facilities for unusual trends that could indicate bioterrorism. There are several other systems, as well.

Two issues quickly emerge in looking at current surveillance systems. First, a long-standing problem has been getting medical professionals to report the information on which such systems rely. Often they do not take the time or make the effort. For this reason, systems are seeking to use automated means for monitoring information that is provided through increasingly user-friendly electronic technology. The Rapid Syndrome Validation Project (RSVP) is one such effort that seeks to facilitate data collection and analysis using syndromic surveillance (although the utility of syndromic surveillance is itself the subject of some debate).

The second major issue is that, despite the many and various surveillance systems being deployed, even as pilot projects, the integration of these capabilities into a single nation-wide system has not been achieved. Part of this lack of integration may reflect the different sponsors of the various programs; the Department of Energy, for example, supports RSVP, while ESSENCE is a Department of Defense (DOD) program. Perhaps RODS will become the major system around which integration will occur as it is supported by both DOD and the Department of Health and Human Services (HHS) and their subsidiary entities, the Centers for Disease Control and Prevention (CDC) and the Defense Advanced Research Project Agency (DARPA).

Enhancing Laboratory Capacity

Another function to which the administration has given considerable priority is enhancing laboratory capacity. The anthrax experience highlighted the lack of surge capacity to deal with the rapidly increasing number of samples produced by an event, which generated a severe backlog, to say nothing of the spike in hoaxes that also occurred. It also underlined the inadequate capabilities at local levels for identification and diagnosis.

The building of laboratory capacity at the state and local levels focuses on two areas. The first is capacity building, which is being promoted primarily by federal funding of state and local preparedness efforts, particularly through the CDC. The goal is to expand the number of bioterrorism agents that state and local labs can identify, expand their ability to handle dangerous pathogens, and implement appropriate protocols. In the FY 2003 budget, the president requested $200 million to improve state and local laboratory capacity.

The second area of enhancing lab capabilities focuses on improving linkages between state and local public health laboratories and private sector and clinical laboratories. The major initiative in this regard is the Laboratory Response Network (LRN), which establishes connections between laboratories with different safety and containment levels, as well as different proficiencies in identifying agents. The goals are to establish a minimum diagnostic capability in every state to identify and confirm some agents (including anthrax, plague, and tularemia), and to create a system with the ability to refer and handle bioterrorism specimens "up the chain" if advanced diagnostics are needed. While a basic system of 80 laboratories is now in place, to achieve the necessary capacity, there is still a need to incorporate private sector laboratories into the system and to ensure that they are familiar with the necessary protocols for handling samples and other important tasks.

Two other potential issues risk diminishing the progress that has been made to date in enhancing laboratory capacity. First, additional capacity will mean little if there is not enough staff to exploit it. Although a number of training efforts are underway, such as the National Laboratory Training Network, concerns remain that there are insufficient numbers of laboratory personnel adequately trained in bioterrorism-specific areas, especially advanced diagnostic techniques and the identification of biological weapons agents.

The second problem reflects the consequences of the need to make choices in the face of limited resources. Especially since the anthrax mailings, public health laboratories have focused on bolstering their bioterrorism capabilities. They have done little, however, to address chemical agent threats. The *Washington Post* reported (7 February 2003) that in a survey of 50 state public health laboratories, on a scale of 1 to 10, 37 rated their chemical response capability at or below 4, while 9 labs gave themselves a score of 5 or 6. Only 8 labs have chemical response plans, and there are no national protocols for testing or shipping suspicious chemicals, as there are for pathogens. Not everyone agrees that laboratory confirmation of a chemical release is necessary or worth a significant investment in the way that is needed in the biological case. But according to the executive director of the Association of Public Health Laboratories quoted in the *Post* story, "We have almost nothing in place if an event occurred tomorrow," and the labs were asked to help in the response.

Medical Research

A third priority area for the administration has been medical research. The National Institute for Allergies and Infectious Diseases (NIH/NIAID) at NIH spearheads this effort. The Bush administration requested more than a six-fold increase in bioterrorism research totaling $1.748 billion. Of this amount, $978 was to be for basic and applied research ($441 for basic

research; $195 million for clinical research, and $342 million for therapeutics, drugs and vaccines), $250 million for procurement of anthrax vaccine, and $521million for construction of and renovation of Biosafety Level 3 and Biosafety Level 4 laboratories.

NIAID's strategic plan for bioterrorism research divides the agenda into six categories: microbial biology, human immune response, vaccines, therapeutics/ treatments, diagnostics, and research resources. NIAID has established seven critical research programs around three priorities: 1) investigating high-priority biological diseases; 2) encouraging government partnerships with business and academics; and 3) expanding existing NIAID bioterrorism or infectious disease research programs that support the six priority research areas. These include anthrax vaccine contracts, a rapid-response grant program, partnerships for novel therapeutic, diagnostic, and vector control strategies, exploratory grants, U.S.-based collaboration in emerging viral and prion diseases, a small business program on bioterrorism-related research, and investigator-initiated small research grants. These programs make up the foundation for NIAID bioterrorism research activities.

An important addition to the research agenda was announced in President Bush's 2003 State of the Union message. As part of Project Bioshield, the president called for an additional $6 billion over 10 years to ensure that resources are available for developing "next generation" medical countermeasures. In further discussing Project Bioshield at a speech at NIH, the president argued that the United States "must rebuild America's capacity to produce vaccines by committing the federal government to the purchase of medicines to combat terror."

According to a White House Fact Sheet, Project Bioshield is to emphasize developing those next generation medical countermeasures based on the most recent scientific discoveries. It is to concentrate particularly on treatments for smallpox, anthrax, and botulinum toxin, and for

such diseases as Ebola and plague "as soon as scientists verify the safety and effectiveness of those products." In addition, Project Bioshield is to give to the Food and Drug Administration (FDA) the ability to make promising treatments quickly available in emergency situations.

Project Bioshield fills a gap in the research and development agenda through its emphasis on exploiting the latest scientific discoveries. Research and development must keep pace with the incredibly rapid advances now occurring in the life sciences. How basic research that exploits new science gets quickly translated into products, however, remains a question. The ability of the FDA to authorize what are essentially experimental drugs in emergency situations should help, but even in this case, caution is likely to characterize any such decision.

Project Bioshield reflects another question about the research program that relates to the proper balance that should be drawn between focusing on the known and the unknown. Project Bioshield will address known biological agents. One could argue that a program intended to exploit the latest scientific discoveries should also have an element that seeks to develop medical treatments for diseases that are not at the top of the CDC select-agent list or that would be unknown when confronted and not easily diagnosed.

Public Health Preparedness

Given the Bush administration's concerns about the state of the public health system around the country, another important priority has been to build capacity and bolster capabilities at the state and local levels to improve consequence management and mitigation. Three programs that should be mentioned in this regard are the Metropolitan Medical Response System (MMRS), the Public Health Preparedness and Response for Bioterrorism Initiative, and the Bioterrorism Hospital Preparedness Program.

The primary focus of the MMRS is to develop or enhance existing emergency preparedness systems at the local level. The goal is to coordinate the efforts of local law enforcement, fire, HAZMAT, emergency medical services, hospital, public health, and other personnel to improve response capabilities. Under the program the 122 largest cities in the United States had to submit a preparedness plan to receive federal funding to support preparedness efforts. Those plans had to cover a number of items, including detection and identification of toxic agents or disease, extraction of victims from contaminated areas, decontamination, mass immunization or prophylaxis, and mass fatality management, among others.

Over the five years of the program, MMRS has achieved its goal of getting the participation of the 122 most populous U.S. cities. But there are some shortcomings in the system. The geographic scope of an MMRS city, for example, varies. Some cities decided to include suburbs into their planning effort. Others did not, limiting themselves to what was inside their city limits.

Due to the contractual arrangement between the cities and the Office of Emergency Preparedness, which oversees the MMRS program (initially part of HHS, but to become part of the Department of Homeland Security [DHS]), the federal government also cannot mandate that MMRS cities make themselves and their capabilities available, or even transparent to, their state. In light of the recent push for states to develop programs to enhance their response capabilities, this proves an unnecessary and unhelpful potential impediment to better planning at the state level.

The Public Health Preparedness and Response Initiative is implemented by the CDC and focuses specifically on the public health dimension of local response capabilities. The program

works with federal, state, and local partners to ensure that planning and training is focused on core public health capacities at the local and state levels in an integrated way. Under the program the money is provided primarily to state governments who have the flexibility to spend it on what they consider to be their greatest needs.

The program, together with other efforts, has had some impact; but, as with many things addressed in this paper, there is good news and bad news. The good news is that in a recent survey of more than 500 public health agencies in 44 states, conducted by the National Association of Counties and the National Association of County and City Health Officials, more than 80 percent of those departments believed they are better prepared to respond to a biological attack than they were a year ago. On the bad news side, only 3 percent of those agencies believed they were fully prepared to deal with such an attack, while just about one third indicated they were still in the early stages of planning or had no plan in place and no resources. Just under half of the respondents indicated they were about "halfway to where they want to be" (*Counterterrorism, Chem-Bio Weapons and Defense Monitor, February 3, 2003, p. 5*).

The survey also reinforced the need for continued and reliable funding from the federal government to support preparedness efforts. Local and state public health authorities have been asked to develop a number of capabilities, including distribution systems for the National Pharmaceutical Stockpile and plans to implement the administration's smallpox vaccination program. State governments, however, face their worst financial crisis since the end of World War II, with a budget shortfall that totals some $67 billion. In the view of the states, such funding shortages will require slowdowns and sacrifices in bioterrorism-preparedness efforts, even with continued federal funding, which has been very slow to arrive.

A third program that addresses a critical component of the preparedness spectrum is the Bioterrorism Hospital Preparedness Program, run by HHS's Health Resources Services Administration (HRSA). This program is intended to result in states and municipalities being able to upgrade hospitals and other health care facilities, develop a multi-tiered system in which local health care facilities are prepared to triage, treat, stabilize, and refer multiple casualties to identified centers of excellence, or develop multi-state or regional consortia to pool limited funding to accomplish these goals.

Hospitals are a critical node in any bioterrorism-preparedness effort, and for several years, less attention has been given to hospitals than should have been the case. As private sector, often for-profit enterprises, hospitals operate on small financial margins that do not allow them to maintain the necessary surge capacity in beds, medicines, or staff. They have little reason to invest in such capabilities themselves, and they look to the federal government to provide the financial incentives for doing so.

Vaccines and Vaccinations

A final area that serves as an example of the current state of the nation's capability to respond to a bioterrorism attack against the homeland is the Bush administration's vaccination policy. In December 2002, President Bush announced his plan for a two-stage immunization effort to protect the nation against smallpox. Approximately 500,000 health workers are to be inoculated in the first stage with up to 10 million health workers, firefighters, police, and emergency personnel to be included in the second stage. The administration rejected the idea of a national public vaccination program because of the certainty that it would entail significant harm.

Even the current program entails some degree of risk. A RAND Corporation study concluded, for example, that if the 10 million emergency personnel were all to be vaccinated, 25 people would probably die (*Global Security Newswire, December 20, 2002).* This may seem a small number; many people deem it an acceptable level or risk. Uncertainty about the results of the president's program, however, is sufficiently high enough that a panel of medical experts, convened by the CDC under the auspices of the Institute of Medicine to advise on the immunization program, warned against proceeding too quickly. The draft Institute of Medicine (IOM) report argues that enough time should elapse between the two phases of the program so that an evaluation of the first phase can be completed and lessons identified. The draft report also expressed concern over who would pay compensation for lost wages and medical treatment in the event of adverse reactions, given the fact that the federal government will not do so and state worker-compensation laws might not be applicable.

The concern about adverse effects has led some medical professionals and facilities not to participate in the president's program. They argue that the likelihood of a smallpox attack is not high enough to justify the risks that might be associated with receiving the vaccine. This lack of "buy-in" suggests that the administration has not articulated as convincing an argument in favor of its approach as it would like. One should note that a similar rejection of vaccinations occurred earlier in the military with respect to the anthrax vaccine.

The reaction to the smallpox vaccination plan highlights that the public is not necessarily comfortable with the current national situation regarding vaccines and vaccine policies. The problem is not just one of delivering an effective argument in favor of a particular vaccine, but broader. Not only does the United States face difficult choices in developing vaccine delivery policies, but the entire U.S. system for developing and producing vaccines needs attention. The

vaccine production base in industry has eroded to almost nothing. Vaccines for such diseases as smallpox and anthrax are given high priority, but there are marked shortages of vaccines for use against other serious diseases, even though they may not always be on the list of select-biological agents.

A national strategy for developing, testing, producing, stockpiling, and distributing vaccines, therefore, should be elaborated. An integrated approach that deals cost-effectively with a range of unresolved vaccine issues – among them balancing military and civilian requirements, manufacturing shortages, available vaccine versus the next generation – has not been developed by the federal government. One is needed.

Future Priorities from a Strategic Perspective

The preceding section examined a number of specific programs that are part of the current effort to develop an effective response to biological threat to homeland security. That examination supports a conclusion that many programs are underway and many of them have produced improvements, sometimes notable, in the nation's response posture. In that each of the programs was portrayed as having some problems in implementation or concept, however, it is hoped these examples also convey a strong sense that the job is not complete.

A broader perspective that goes beyond individual programs, however, is also needed. Looking at the whole picture in a strategic sense offers an important additional sense of what remains to be done. Three areas in particular can be identified.

An Organizational Question

Institutionally, the critical federal government actors responding to the biological challenge are the Department of Health and Human Services (HHS) (and its subsidiary entities, especially the Centers for Disease Control and Prevention [CDC] and the National Institutes of

Health [NIH]), the Department of Defense (DOD), and the new Department of Homeland Security (DHS). It remains to be seen how well these lead players will coordinate to ensure an integrated, coherent response.

In particular, how are stovepiped, overlapping, split, or uncertain responsibilities to be brought together into an integrated, coherent whole? How is the responsibility for integrating issues across departments and agencies to be handled? Where in the executive branch is the final arbiter for decisions regarding tradeoffs between strategy elements when agreement cannot be achieved? There is no apparent mechanism. Looking at the organizational chart for the new DHS, for example, it is not obvious who will be the "bio" champion in the new department. If the White House Office of Homeland Security (OHS) is to retain responsibility for coordination, officials must ensure that there is someone at a sufficiently senior level within OHS to make certain that there is effective, integrated coordination both within the executive branch and with the many entities of Congress that will be active on these issues.

Building Partnerships

Addressing a challenge as complex and multifaceted as that posed by the misuse of biology requires contributions from many more actors than policy makers and government bureaucrats. In particular, it demands reaching out to many entities in the private sector who have much to contribute to ensuring an effective response. Some of these actors have not traditionally been involved with questions of security in a significant way. They must become so now.

The scientific community obviously has much to offer. Scientists can make valuable direct contributions to enhancing biological security. Their discoveries can be the catalyst for major improvements – sometimes dramatic – in response capabilities in such areas as reliable, timely, and accurate detectors and effective medical treatments. Such gains, however, will require overcoming a traditional reluctance within the life-sciences community to conduct security-related research. Although attitudes within the scientific community are changing in this regard, that community still has a considerable way to go to provide both the strong leadership and sustained involvement with government that will be needed.

Another key partner for government is the pharmaceutical and biotechnology industry. Some people in industry – but only some – are aware that growing public and government concern over developments in the life sciences and increasing biological threats requires action on their part because they stand on the cutting edge of the application of such science. In particular, due to the rapid rate of scientific and technological advance, governments are too slow to adjust to the realities and potential risks such developments generate. The challenge to both government and industry is to engage on issues of biological security in a way that takes full account of legitimate security concerns, without harming innovation and inhibiting efforts to exploit scientific and technological advances for their many benefits.

One unique aspect of developing an effective response to the biological challenge is the fact that many of the key assets that serve as the foundation for such a response are in private hands. This is especially true with respect to the first line of defense against biological attack – health and medical capabilities. The federal government has sought to establish close ties with these key assets. The lack of "buy in" into the administration's smallpox vaccine policy by a

number of hospitals and medical professionals across the nation, however, demonstrates that these relationships are not yet mature.

To build on and deepen the relationships that have begun to be established, the administration should initiate a "National Dialogue" on bioterrorism preparedness with special emphasis on engaging the private health-care sector. Such a national dialogue would serve to define expectations of both the government and the private sector, clarify respective roles and responsibilities, foster stronger personal working relationships in a situation in which lack of familiarity continues to be an issue, and move the action agenda forward.

Critical Communications

Meeting the biological threat to homeland security will depend to a considerable degree on the ability to communicate – to the get the right information to the right people at the right time. Effective communication is a pre-requisite because it makes each element of a response capability work better, and in some cases, work at all.

Several improvements are required, however, given current areas of weakness in the information infrastructure for combating homeland security threats in general, and unconventional threats in particular. First, public information before, during, and after a bioterrorism incident is a vital element of preparedness. At the moment, it is perhaps also one of the weakest elements of preparedness efforts. Officials need to formulate and then execute a robust strategy for public engagement and outreach to inform the public about 1) the risk of bioterrorism; 2) the programs underway to prevent and prepare for bioterrorism; and 3) steps people should take to prepare themselves for future incidents. A key part of this effort must be a good working relationship with the media. Creating such a relationship will require a way of dealing with the inevitable tension that exists between what media representatives believe they

need to "do their job," and efforts of government representatives to implement their communication strategy.

Second, although the private sector is an indispensable partner, existing mechanisms for public-private dialogue on issues relating to security and the biological sciences have been marked by confusion, tension, and argument. New modes of engagement are needed to formulate a genuine partnership between not just the U.S. government, but governments around the world, and the biological sciences community.

Third, the most advanced state-of-the-art information technology and telecommunications systems must be available, and they must ensure the sharing, management, and assessment of critical information. To meet this objective, the Department of Homeland Security should institute a continual review of the latest communications- technology developments and develop a procedure by which such technology can be introduced in a streamlined and expedited manner.

As important as the technology, however, is fostering a habit of communication among all key players. During the anthrax experience, both the CDC and the FBI discovered they had no experience of working together and their lack of communications slowed down their responses in the initial phases of that effort. With better communications experience came a better and more productive relationship.

Conclusion

The major conclusion of this paper is that current efforts to address biological threats to U.S. homeland security have produced significant progress, but have still not achieved a goal of providing the level of preparedness that is necessary. This is not a particularly dramatic finding. But it does capture the status of the current situation. More importantly, it highlights the reality

that there is neither a single measure that will "solve" the problem nor one set of activities that can be pursued to accomplish the goal. Rather, incremental improvements across a wide range of response measures are required, and they are the only means by which progress can be made in the face of limited resources.

The question for the long-term, then, is not whether the necessary steps are being taken. Major gaps are hard to identify. But an accumulation of smaller shortcomings could undermine the system under the stress of a severe incident. Those shortcomings must continue to be addressed. The major issue for the future will be whether the Congress and the administration will sustain the commitment to meet critical requirements and express that commitment in adequate levels of funding to get the job done.

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